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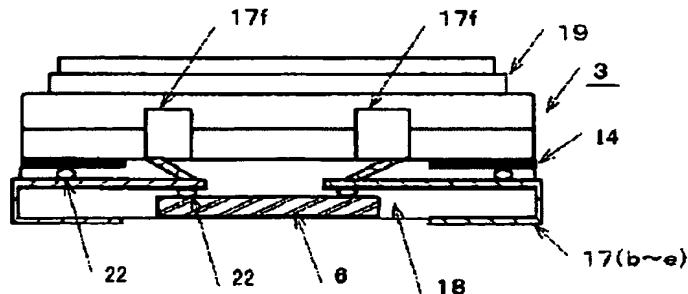
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APPLICANT : NIPPON DEMPA KOGYO CO LTD;

INVENTOR : MORIYA KOICHI;

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TITLE : TEMPERATURE COMPENSATING
CRYSTAL OSCILLATOR FOR
SURFACE MOUNTING



ABSTRACT : PROBLEM TO BE SOLVED: To provide a reliable temperature compensating crystal oscillator for surface mounting that is specially suitable for reduced height, and has improved productivity.

SOLUTION: In the temperature compensating crystal oscillator for surface mounting, a flat terminal plate having a plurality of lead terminals is provided, IC chips are arranged at the other-surface side of the flat terminal plate for directly connecting each lead terminal to a plurality of terminal electrodes of the IC chip, a crystal oscillator is arranged at the one surface side of the flat terminal plate, at the same time, the lead terminal connected to the crystal terminal electrode of the IC chip is directly connected to the mounting electrode of the crystal oscillator for resin-molding the IC chips, the lead terminal connected to the power supply, output, and terminal electrode for grounding of the IC chips is used as a mounting terminal for surface mounting for bending from the side of the resin molding to the bottom surface, and the lead terminal connected to the temperature compensating mechanism of the IC chip for writing compensation data is bent to the side of the crystal oscillator.

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CLAIMS

[Claim(s)]

[Claim 1] In the temperature compensated crystal oscillator for surface mounts which consists of a quartz resonator which carries out sealing enclosure of the Xtal piece, and has the mounting electrode of a couple on a base, and an IC chip equipped with the oscillator circuit and temperature compensation device except said quartz resonator On the other hand, arrange said IC chip to a side and said each lead terminal and two or more terminal electrodes of said IC chip are directly connected to it. the plate-like terminal assembly which has two or more lead terminals -- having -- said plate-like terminal assembly -- Connect directly the mounting electrode of said lead terminal connected to the Xtal terminal electrode of said IC chip while having arranged said quartz resonator to the whole surface side of said plate-like terminal assembly, and said quartz resonator, and the resin mould of said IC chip is carried out. Said lead terminal linked to the terminal electrode for the power source of said IC chip, an output, and a ground is bent on a base from the side face of said resin mould as a mounting terminal for surface mounts. The temperature compensated crystal oscillator characterized by bending said lead terminal which connects with said temperature compensation device and writes in compensation data on the side face of said quartz resonator.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention makes the temperature compensated crystal oscillator for surface mounts (it considers as a temperature-compensation oscillator) the technical field on industry, and relates to the temperature-compensation oscillator which promoted especially the miniaturization.

[0002] (Background of invention) To a temperature change, since an oscillation frequency is stability, a temperature-compensation oscillator is used for the cellular phone used under a dynamic environment. In recent years, small intensifies and low back-ization is called for with the flat-surface appearance.

[0003] (An example of the conventional technique) Drawing 4 is a schematic diagram of the temperature-compensation oscillator explaining the 1 conventional example. A temperature-compensation oscillator consists of a ridge oscillator 1 and a temperature-compensation device 2. A ridge oscillator 1 consists of a quartz resonator 3 and an oscillator circuit 4. The temperature-compensation device 2 is impressed to the electrical-potential-difference variable-capacity component 5 which inserted the compensation electrical potential difference from the compensation electrical-potential-difference generating circuit which is not illustrated into the closed loop of a ridge oscillator 1. With the compensation data based on the frequency temperature characteristic of a ridge oscillator 1, a compensation electrical-potential-difference generating circuit generates a compensation electrical potential difference. The IC chip 6 and quartz resonator 3 which were shown by the dotted-line frame which integrated the oscillator circuit 4 and the temperature compensation device 2 are unified, and it consists of such things.

[0004] As the 1st concrete example (two-room type), as shown in drawing 5, the Xtal piece 8 is held to one crevice of the body 7 of a container which consists of a laminating ceramic which made the cross-section configuration the shape of H character, for example, by seam welding, covering 9 is put and sealing enclosure is carried out. And the circuit element which includes the IC chip 6 at least is held in the crevice of another side, and a filler (un-illustrating) is laid underground. In the side attachment wall and end face of a crevice of another side, it has the mounting terminal 10 for surface mounts. Moreover, the write-in terminal 11 of compensation data is formed in the side face of the body 7 of a container. the electroconductive glue which the sign 12 in drawing connects the Xtal piece 8 electrically and mechanically, and is held -- said -- 19 is a metal ring for seam welding.

[0005] As the 2nd example (junction type), it considers, for example as the configuration which joined the mounting container 13 which held IC chip to the rear face of the quartz resonator 3 which carried out sealing enclosure of the Xtal piece 8 into the body of a container which consists of the existing quartz resonator 3, i.e., laminating ceramic, (drawing 6). However, in the side face of the mounting container 13, it has the write-in terminal 11, and has the mounting terminal 10 in an end face and a side face. the sign 14 in drawing -- the mounting electrode of a quartz resonator 3 -- said - 15 is the junction electrode of the mounting container 13.

[0006] It considers as the configuration which fixed the IC chip 6 on the crevice base of the body 16 of a container, fixed the Xtal piece 8 to the step of a crevice, and carried out sealing enclosure as the 3rd example (part store type) (drawing 7). However, in the side face of the body 16 of a container, it has the write-in terminal 11, and has the mounting terminal 10 in a side face and a rear face.

[0007]

[Problem(s) to be Solved by the Invention] (Trouble of the conventional technique) However, in the temperature-compensation oscillator of the above-mentioned configuration, the next problem of a certain thing had each description. That is, by the 1st-example two-room type (drawing 5), since the IC chip 6 was held after carrying out sealing enclosure of the Xtal piece 8 into seven within the body of a container, the production process became series and there was a problem to which productivity falls. Moreover, since the body 7 of a container is formed in the shape of H of baking, bending is produced in the horizontal level (central dashboard) made into the shape of H, and flatness is bad. When following, for example, fixing the IC chip 6 by the ultrasonic thermocompression bonding using a bump etc., there was a problem which wakes up an electric faulty connection.

[0008] Moreover, by the 2nd junction type (drawing 6), since what is necessary is to manufacture the mounting container 13 in juxtaposition and just to join with a quartz resonator 3, productivity is raised. However, since the quartz resonator 3 and the mounting container 13 had the bottom wall, there was a problem which enlarges the part height dimension.

[0009] Furthermore, by the 3rd-example one-room type (drawing 7), although it was the easiest to realize low back-ization, since the Xtal piece 8 was held after fixing the IC chip 6, there was a problem which cannot perform strong excitation which removes the property and the very small foreign matter as quartz-resonator 3 simple substance. That is, there was a problem which lacks in dependability.

[0010] (The object of invention) Especially this invention aims at offering the temperature-compensation oscillator which fitted low back-ization and raised productivity and dependability.

[0011]

[Means for Solving the Problem] This invention is equipped with the plate-like terminal assembly 17 which has two or more lead terminals 17 (a-f). On the other hand, arrange the IC chip 6 to a side and each lead terminal 17 (a-f) and two or more terminal electrodes of the IC chip 6 are directly connected to it. the plate-like terminal assembly 17 -- Connect directly lead terminal 17a and the mounting electrode 14 of a quartz resonator 3 which were connected to the Xtal terminal electrode of the IC chip 6 while having arranged the quartz resonator 3 to the whole surface side of the plate-like terminal assembly 17, and the IC chip 6 is carried out resin mould 18. The lead terminal 17 (b-e) linked to the terminal electrode for the power source of the IC chip 6, an output, and a ground is bent on a base from the side face of the resin mould 18 as a mounting terminal for surface mounts. Let it be a solution means to have bent 17f of lead terminals which connect with the temperature compensation device of the IC chip 6, and write in compensation data on the side face of a quartz resonator 3 (refer to Figs. 1 - 3).

[0012]

[Function] In this invention, IC chip and the mounting terminal of a plate-like terminal assembly are connected separately from the production process of a quartz resonator, and it unites with a quartz resonator after that. Therefore, as compared with a two-room type (H structure), it considers as a juxtaposition-production process. And as compared with a two-room type dashboard, flatness of a plate-like terminal assembly is made good. Moreover, as compared with a junction type, since a plate-like terminal assembly is used, the bottom wall layer of a mounting container is made unnecessary. Furthermore, since the quartz resonator which carried out sealing enclosure of the Xtal piece is used as compared with an one-room type, it can treat independently. Hereafter, one example of this invention is explained.

[0013]

[Example] Figs. 1 thru/or 3 are drawings of the temperature-compensation oscillator explaining one example of this invention, and a bottom view and drawing 3 of the sectional view where drawing 1 is typical, and drawing 2 are drawings of a plate-like terminal assembly. in addition, a jack per line is given to the same part as the before conventional example Fig., and the explanation is simple -- or it omits. A temperature-compensation oscillator serves as the ridge oscillator 1 which consists of a quartz resonator 3 and an oscillator circuit 4 from the temperature-compensation device 2 in which a compensation electrical potential difference is impressed to the electrical-potential-difference variable-capacity component 5 inserted into the oscillation closed loop. And it comes to integrate an oscillator circuit 4 and the temperature compensation device 2 including the electrical-potential-

difference variable-capacity component 5 except a quartz resonator 3 in the IC chip 6 (refer to front drawing 4).

[0014] A temperature compensation oscillator is constituted from a quartz resonator 3, the IC chip 6, the plate-like terminal assembly 17, and the resin mould 18 by this example. A quartz resonator 3 carries out sealing enclosure of the Xtal piece 8 into the body of a container as mentioned above, and has a mounting electrode on a base. The plate-like terminal assembly 17 becomes unable to put two or more lead terminals 17 (a-f) in order superficially. The end of each lead terminal is concentrated on a central field. Here, press working of sheet metal of the metal plate which consists of copper is carried out, and two or more lead terminals are connected with a frame 20. A sign 21 is the connection section and width of face is omitted.

[0015] In such a thing, each terminal electrode (un-illustrating) exposed to the head of two or more lead terminals 17 (a-f) first concentrated on the central field of the plate-like terminal assembly 17 which has a frame 20, and the front face of the IC chip 6 is connected electrically and mechanically by the ultrasonic thermocompression bonding using a bump 22 (drawing 3). In addition, the dotted line in drawing is the bending section. Next, lead terminal 17a linked to the mounting electrode 14 of the couple of a quartz resonator 3 and the Xtal terminal electrode of the couple of the IC chip 6 electrically connected with a quartz resonator 3 is connected by the ultrasonic thermocompression bonding using the same bump 22 as the above-mentioned.

[0016] Next, metal mold is used for the perimeter of the IC chip 6 arranged on the base of a quartz resonator 3, resin is poured in, this is hardened, and it considers as the resin mould 18. And the lead terminal 17 (bcde) linked to the power source of the IC chip 6, an output, a ground, and an AFC (automatic frequency control) electrode terminal is bent on the underside of a resin mould, and it considers as the mounting terminal for surface mounts. Furthermore, 17f of two or more lead terminals linked to the terminal electrode in which compensation data are written by the temperature compensation device of the IC chip 6 is bent to the side-face side of a quartz resonator 3, and let them be write-in terminals.

[0017] With such a configuration, IC chip and the mounting terminal of a plate-like terminal assembly are connected separately from the production process of a quartz resonator, and it unites with a quartz resonator after that. Therefore, since the Xtal piece 8 made into the conventional example and the IC chip 6 are made into a juxtaposition-production process as compared with the two-room type (H structure) held separately, productivity is improved. Moreover, since the plate-like terminal assembly 17 is used, flatness is made better than the dashboard of H structure. Therefore, electric connection by the bump 22 is ensured in this example. Since the existing quartz resonator which circulates actually in this example especially is used, it becomes economical.

[0018] Moreover, as compared with the junction type which joined the mounting container 13 to the base of a quartz resonator 3, since the plate-like terminal assembly 17 is used, the mounting container 13 is made unnecessary. And since thickness of the plate-like terminal assembly 17 can be made small (about 100 micrometers or less) to the bottom wall layer (about 700 micrometers) of the mounting container 13, low back-ization as the whole is promoted.

[0019] Furthermore, as compared with the one-room type which holds the Xtal piece 8 and the IC chip 6 together, the quartz resonator 3 which carried out sealing enclosure of the Xtal piece 8 is used. Therefore, a quartz resonator can be treated independently and the electrical characteristics as a quartz-resonator simple substance can be checked beforehand. And the foreign matter by strong excitation can be removed and the so-called cure against DLD (Drive Level dependency) can be performed. Therefore, dependability is raised.

[0020] Moreover, since the mounting terminal 17 (b-e) bent 17f of lead terminals used as a write-in terminal to the quartz-resonator side of the reverse sense, electrical installation with the circuit pattern of the circuit board in which this is carried is certainly avoidable.

[0021]

[Other matters] What is necessary is to be able to apply, even when it has a mounting electrode, for example in four corners, and just to, change each lead terminal of the plate-like terminal assembly 17 into arbitration in short, although the quartz resonator 3 with which the mounting electrode 14 was formed in the ends side was used in this invention. Moreover, although 17f of lead terminals used as a write-in terminal was bent on the side face of a quartz resonator 3, notching can be prepared, for

example in the side face of a quartz resonator 3, it can lay underground in a field, and a flat-surface dimension can also be maintained.

[0022] Moreover, although the resin mould only of the IC chip was arranged and carried out to the other principal plane side of the plate-like terminal assembly 17, the bypass capacitor of a during [the power source which is not illustrated, for example and a ground] may be formed. In this case, what is necessary is just to add the lead terminal for these to the plate-like terminal assembly 17. Moreover, although 17f of lead terminals for write-in terminals was made into four pieces, it can fluctuate if needed, and they extend lead terminal 17a connected with the Xtal terminal electrode further, for example to a quartz-resonator 3 side, and may enable it to measure the property of a quartz-resonator simple substance for a temperature-compensation oscillator after assembly.

[0023] Moreover, although each terminal electrode of the IC chip 6, a lead terminal 17 (a-f) and the mounting electrode 14, and lead terminal 17a considered as the ultrasonic thermocompression bonding or thermocompression bonding which used the bump, the connection using electroconductive glue etc. according to the need is sufficient, and it is good if electrical installation is trustworthy in short.

[0024]

[Effect of the Invention] On the other hand, arrange IC chip to a side and each lead terminal and two or more terminal electrodes of IC chip are directly connected to it. the plate-like terminal assembly with which this invention has two or more lead terminals -- having -- a plate-like terminal assembly - - Connect directly the mounting electrode of a lead terminal and a quartz resonator connected to the Xtal terminal electrode of IC chip while having arranged the quartz resonator to the whole surface side of a plate-like terminal assembly, and the resin mould of the IC chip is carried out. The lead terminal linked to the terminal electrode for the power source of IC chip, an output, and a ground is bent on a base from the side face of a resin mould as a mounting terminal for surface mounts. Since the lead terminal which connects with the temperature compensation device of IC chip, and writes in compensation data was bent on the side face of a quartz resonator, the temperature compensation oscillator which fitted especially low back-ization and raised productivity and dependability can be offered.

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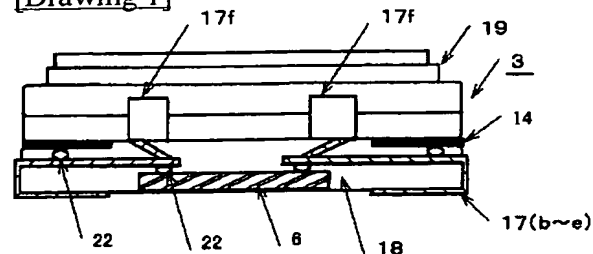
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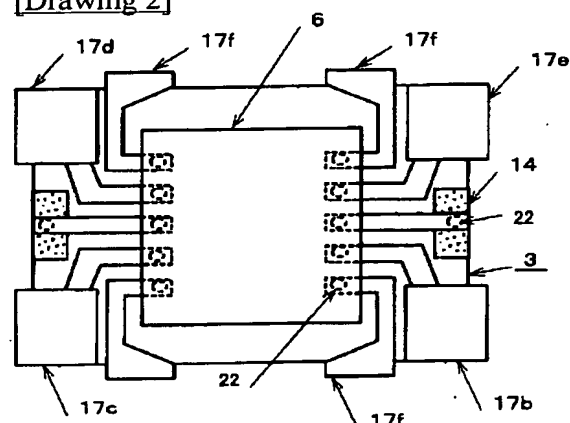
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DRAWINGS

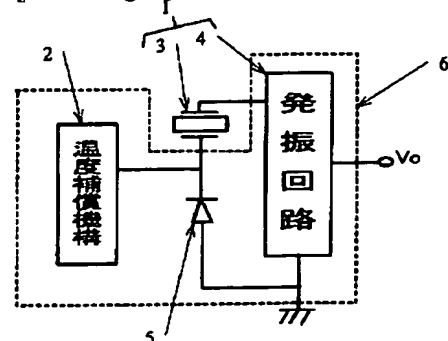
[Drawing 1]



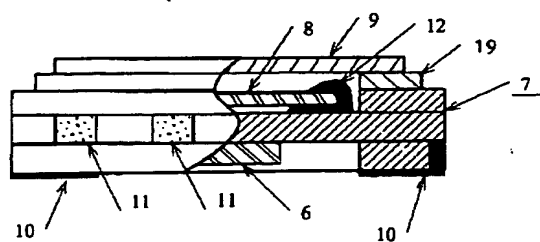
[Drawing 2]



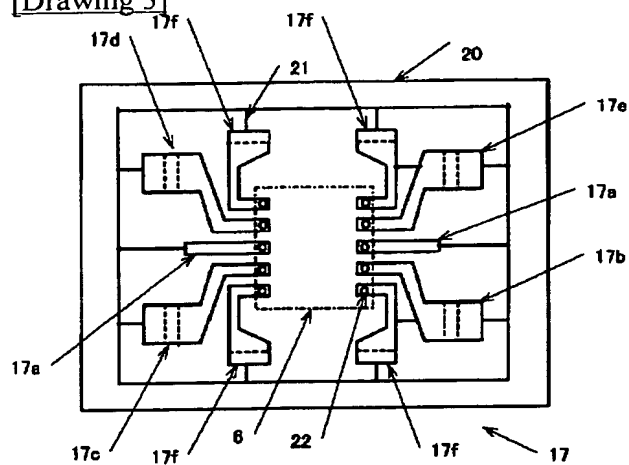
[Drawing 4]



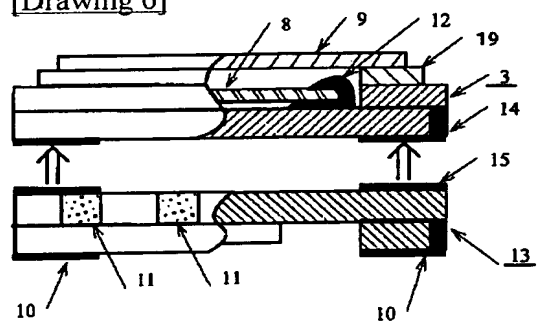
[Drawing 5]



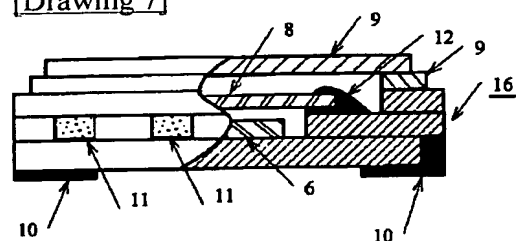
[Drawing 3]



[Drawing 6]



[Drawing 7]



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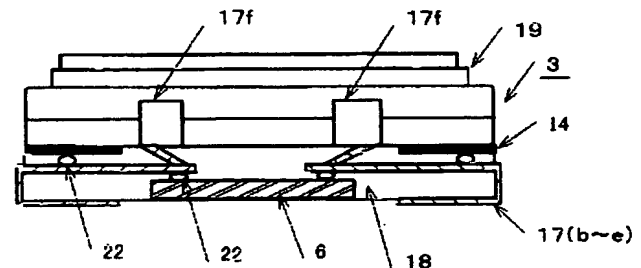
(71) 出願人 000232483
日本電波工業株式会社
東京都渋谷区西原1丁目21番2号
(72) 発明者 守谷 貢一
埼玉県狭山市大字上広瀬1275番地の2 11
本電波工業株式会社狭山事業所内
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(54) 【発明の名称】 表面実装用の温度補償水晶発振器

(57) 【要約】

【目的】 特に低背化に適して生産性及び信頼性を高めた表面実装用の温度補償発振器を提供することを目的とする。

【構成】 複数のリード端子を有する平板状端子板を備え、平板状端子板の他面側に I C チップを配置して各リード端子と I C チップの複数の端子電極とを直接的に接続し、平板状端子板の一面側に水晶振動子を配置するとともに I C チップの水晶端子電極に接続したリード端子と水晶振動子の実装電極とを直接的に接続して I C チップを樹脂モールドし、I C チップの電源、出力及びアース用の端子電極に接続したリード端子を表面実装用の実装端子として樹脂モールドの側面から底面に折曲し、I C チップの温度補償機構と接続して補償データを書き込むリード端子を水晶振動子の側面に折曲した構成とする。



【特許請求の範囲】

【請求項1】水晶片を密閉封入して底面に一対の実装電極を有する水晶振動子と、前記水晶振動子を除く発振回路及び温度補償機構を備えたICチップとからなる表面実装用の温度補償水晶発振器において、複数のリード端子を有する平板状端子板を備え、前記平板状端子板の他面側に前記ICチップを配置して前記各リード端子と前記ICチップの複数の端子電極とを直接的に接続し、前記平板状端子板の一面側に前記水晶振動子を配置するとともに前記ICチップの水晶端子電極に接続した前記リード端子と前記水晶振動子の実装電極とを直接的に接続して前記ICチップを樹脂モールドし、前記ICチップの電源、出力及びアース用の端子電極に接続した前記リード端子を表面実装用の実装端子として前記樹脂モールドの側面から底面に折曲し、前記温度補償機構と接続して補償データを書き込む前記リード端子を前記水晶振動子の側面に折曲したことを特徴とする温度補償水晶発振器。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は表面実装用の温度補償水晶発振器（温度補償発振器とする）を産業上の技術分野とし、特に小型化を促進した温度補償発振器に関する。

【0002】（発明の背景）温度補償発振器は、温度変化に対して発振周波数が安定なことから、動的環境下で使用される携帯電話等に使用される。近年では、小型が激化し平面外形とともに低背化が求められている。

【0003】（従来技術の一例）第4図は一従来例を説明する温度補償発振器の概略図である。温度補償発振器は、水晶発振回路1と温度補償機構2からなる。水晶発振回路1は水晶振動子3と発振回路4からなる。温度補償機構2は、図示しない補償電圧発生回路からの補償電圧を、水晶発振回路1の閉ループ内に挿入した電圧可変容量素子5に印加する。補償電圧発生回路は水晶発振回路1の周波数温度特性に基づいた補償データによって、補償電圧を発生する。このようなものでは、発振回路4及び温度補償機構2を集積化した点線枠で示したICチップ6と水晶振動子3とを一体化して構成される。

【0004】具体的な第1例（二部屋タイプ）としては、第5図に示したように例えば断面形状をH字状とした積層セラミックからなる容器本体7の一方の凹部に水晶片8を保持し、例えばシーム溶接によってカバー9を被せて密閉封入する。そして、他方の凹部に少なくともICチップ6を含む回路素子を収容し、充填材（未図示）を埋設する。他方の凹部の側壁及び端面には、表面実装用の実装端子10を有する。また、補償データの書込端子11が容器本体7の側面に設けられる。図中の符号12は水晶片8を電気的・機械的に接続して保持する導電性接着剤、同19はシーム溶接用の金属リングであ

る。

【0005】第2例（接合タイプ）としては、例えば既存の水晶振動子3、即ち積層セラミックからなる容器本体内に水晶片8を密閉封入した水晶振動子3の裏面にICチップを収容した実装容器13を接合した構成とする（第6図）。但し、実装容器13の側面には書込端子11を、端面及び側面には実装端子10を有する。図中の符号14は水晶振動子3の実装電極、同15は実装容器13の接合電極である。

【0006】第3例（一部屋タイプ）としては、容器本体16の凹部底面にICチップ6を、凹部の段部に水晶片8を固着して密閉封入した構成とする（第7図）。但し、容器本体16の側面には書込端子11を、側面及び裏面には実装端子10を有する。

【0007】

【発明が解決しようとする課題】（従来技術の問題点）しかしながら、上記構成の温度補償発振器ではそれぞれの特徴はあるものの次の問題があった。すなわち、第1例の二部屋タイプ（第5図）では、容器本体7内に水晶片8を密閉封入した後、ICチップ6を収容するので、製造工程がシリーズになって生産性が低下する問題があった。また、容器本体7が焼成によってH状に形成されるため、H状とする水平部（中央の仕切板）に撓みを生じて平面度が悪い。したがって、例えばバンプを用いた超音波熱圧着等によってICチップ6を固着する際、電気的な接続不良を起こす問題があった。

【0008】また、第2の接合タイプ（第6図）では、水晶振動子3とともに実装容器13を並列的に製造して接合すればよいので生産性は高められる。しかし、水晶振動子3及び実装容器13とともに底壁を有するので、その分高さ寸法を大きくする問題があった。

【0009】さらに、第3例の一部屋タイプ（第7図）では、最も低背化を実現しやすいが、ICチップ6を固着した後、水晶片8を保持するので、水晶振動子3単体としての特性や微少な異物を除去する強制振を行えない問題があった。すなわち、信頼性に欠ける問題があった。

【0010】（発明の目的）本発明は、特に低背化に適して生産性及び信頼性を高めた温度補償発振器を提供することを目的とする。

【0011】

【課題を解決するための手段】本発明は、複数のリード端子17（a～f）を有する平板状端子板17を備え、平板状端子板17の他面側にICチップ6を配置して各リード端子17（a～f）とICチップ6の複数の端子電極とを直接的に接続し、平板状端子板17の一面側に水晶振動子3を配置するとともにICチップ6の水晶端子電極に接続したリード端子17aと水晶振動子3の実装電極14とを直接的に接続してICチップ6を樹脂モールド18し、ICチップ6の電源、出力及びアース用

の端子電極に接続したリード端子17 (b~e) を表面実装用の実装端子として樹脂モールド18の側面から底面に折曲し、ICチップ6の温度補償機構と接続して補償データを書き込むリード端子17fを水晶振動子3の側面に折曲したことを解決手段とする(第1図~第3図参照)。

【0012】

【作用】本発明では、水晶振動子の製造工程とは別個にICチップと平板状端子板の実装端子とを接続し、その後水晶振動子と一体化する。したがって、二部屋タイプ(H構造)に比較して、並列的な製造工程とする。そして、二部屋タイプの仕切板に比較して、平板状端子板の平面度を良好とする。また、接合タイプに比較して、平板状端子板を使用するので実装容器の底壁層を不要にする。さらに、一部屋タイプに比較し、水晶片を密閉封入した水晶振動子を使用するので、独立して扱える。以下、本発明の一実施例を説明する。

【0013】

【実施例】第1図乃至第3図は本発明の一実施例を説明する温度補償発振器の図で、第1図は模式的な断面図、第2図は底面図、第3図は平板状端子板の図である。なお、前従来例図と同一部分には同番号を付与してその説明は簡略又は省略する。温度補償発振器は、水晶振動子3及び発振回路4からなる水晶発振回路1と、発振閉ループ内に挿入した電圧可変容量素子5に補償電圧を印加する温度補償機構2からなる。そして、水晶振動子3を除く電圧可変容量素子5を含めた発振回路4及び温度補償機構2をICチップ6内に集積化してなる(前第4図参照)。

【0014】この実施例では、温度補償発振器は水晶振動子3とICチップ6と平板状端子板17と樹脂モールド18とから構成される。水晶振動子3は、前述のように容器本体内に水晶片8を密閉封入し、実装電極を底面に有する。平板状端子板17は複数のリード端子17 (a~f) を平面的に並べられてなる。各リード端子の一端は中央領域に集中する。ここでは、銅からなる金属平板をプレス加工して複数のリード端子はフレーム20に連結する。符号21は連結部であり、幅は省略してある。

【0015】このようなものでは、まず、フレーム20を有する平板状端子板17の中央領域に集中した複数のリード端子17 (a~f) の先端と、ICチップ6の表面に露出した各端子電極(未図示)とをバンパ22を用いた超音波熱圧着によって電氣的・機械的に接続する(第3図)。なお、図中の点線は折り曲げ部である。次に、水晶振動子3の一对の実装電極14と、水晶振動子3と電氣的に接続するICチップ6の一对の水晶端子電極に接続したリード端子17aとを、前述同様のバンパ22を用いた超音波熱圧着によって接続する。

【0016】次に、水晶振動子3の底面に配置されたI

Cチップ6の周囲に金型を用いて樹脂を注入し、これを硬化して樹脂モールド18とする。そして、ICチップ6の電源、出力、アース及びAFC(周波数自動制御)電極端子と接続したリード端子17 (bcde) を樹脂モールドの下面に折曲して、表面実装用の実装端子とする。さらに、ICチップ6の温度補償機構に補償データを書き込まれる端子電極に接続した複数のリード端子17fを、水晶振動子3の側面側に折曲して書込端子とする。

【0017】このような構成であれば、水晶振動子の製造工程とは別個にICチップと平板状端子板の実装端子とを接続し、その後水晶振動子と一体化する。したがって、従来例とした水晶片8とICチップ6を別個に収容する二部屋タイプ(H構造)に比較して、並列的な製造工程とするので、生産性を向上する。また、平板状端子板17を使用するので、H構造の仕切板よりも平面度を良好とする。したがって、この例ではバンパ22による電氣的な接続を確実にする。特に、この例では現に流通する既存の水晶振動子を使用するので、経済的となる。

【0018】また、実装容器13を水晶振動子3の底面に接合した接合タイプに比較して、平板状端子板17を使用するので実装容器13を不要にする。そして、実装容器13の底壁層(約700 μ m)に対して平板状端子板17の厚みを小さく(約100 μ m以下)できるので、全体としての低背化を促進する。

【0019】さらに、水晶片8とICチップ6とを一緒に収容する一部屋タイプに比較し、水晶片8を密閉封入した水晶振動子3を使用する。したがって、水晶振動子を独立して扱い、予め水晶振動子単体としての電氣的特性を確認できる。そして、強励振による異物を除去でき、所謂、DLD(Drive Level dependency)対策を行える。したがって、信頼性を高められる。

【0020】また、書込端子となるリード端子17fを実装端子17 (b~e) とは逆向きの水晶振動子側に折曲したので、これが搭載される回路基板の回路パターンとの電氣的接続を確実に避けることができる。

【0021】

【他の事項】本発明では、両端側に実装電極14の形成された水晶振動子3を用いたが、例えば4角部に実装電極を有する場合でも適用でき、要は平板状端子板17の各リード端子を任意に変更すればよい。また、書込端子となるリード端子17fは水晶振動子3の側面に折り曲げたが、例えば水晶振動子3の側面に切り欠きを設けて面内に埋設して平面外形寸法を維持することもできる。

【0022】また、平板状端子板17の他主面側にはICチップのみを配置して樹脂モールドしたが、例えば図示しない電源とアース間とのバイパスコンデンサを設けてもよい。この場合、平板状端子板17にこれ用のリード端子を付加すればよい。また、書込端子用のリード端子17fは4個としたが、必要に応じて増減でき、さら

には例えば水晶端子電極と接続するリード端子17aを水晶振動子3側に延出して、温度補償発振器を組立後に水晶振動子単体の特性を測定できるようにしてもよい。

【0023】また、ICチップ6の各端子電極とリード端子17(a～f)及び実装電極14とリード端子17aはバンプを用いた超音波熱圧着又は熱圧着としたが、必要に応じて導電性接着剤等を用いた接続でもよく要は電氣的接続が確実であればよい。

【0024】

【発明の効果】本発明は、複数のリード端子を有する平板状端子板を備え、平板状端子板の他面側にICチップを配置して各リード端子とICチップの複数の端子電極とを直接的に接続し、平板状端子板の一面側に水晶振動子を配置するとともにICチップの水晶端子電極に接続したリード端子と水晶振動子の実装電極とを直接的に接続してICチップを樹脂モールドし、ICチップの電源、出力及びアース用の端子電極に接続したリード端子を表面実装用の実装端子として樹脂モールドの側面から底面に折曲し、ICチップの温度補償機構と接続して補償データを書き込むリード端子を水晶振動子の側面に折曲したので、特に低背化に適して生産性及び信頼性を高めた温度補償発振器を提供できる。

【図面の簡単な説明】

【図1】本発明の一実施例を説明する温度補償発振器の断面図である。

【図2】本発明の一実施例を説明する温度補償発振器の底面図である。

【図3】本発明の一実施例を説明する平板状端子板の平面図である。

【図4】従来例を説明する温度補償発振器のブロック回路図である。

【図5】従来例の第1例を説明する温度補償発振器の断面図である。

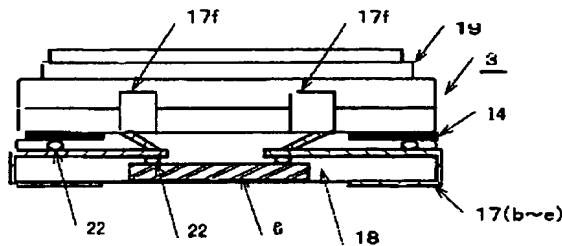
【図6】従来例の第2例を説明する温度補償発振器の断面図である。

【図7】従来例の第3例を説明する温度補償発振器の断面図である。

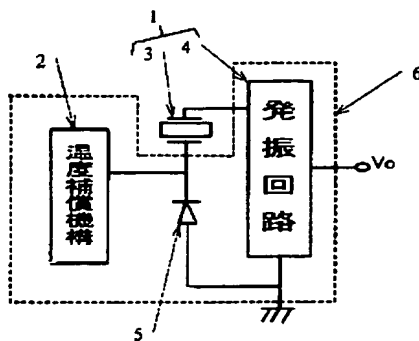
【符号の説明】

1 水晶発振回路、2 温度補償機構、3 水晶振動子、4 発振回路、5 電圧可変容量素子、6 ICチップ、7、16 容器本体、8 水晶片、9 カバー、10 実装端子、11 書込端子、12 導電性接着剤、13 実装容器、14 実装電極、15 接続電極、17 平板状端子板、17(a～f) リード端子、18 樹脂モールド、19 金属リング、20 フレーム、21 連結部、22 バンプ

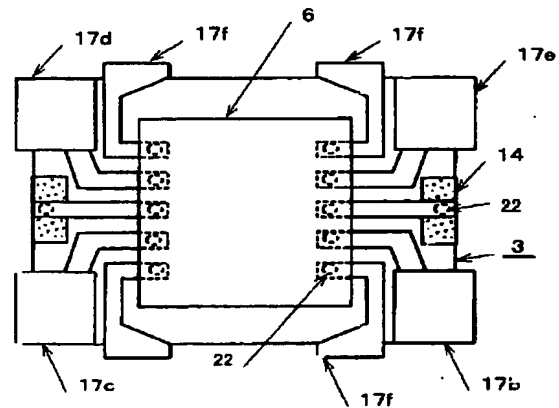
【図1】



【図4】



【図2】



【図5】

